

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-72 (canceled).

73. (Currently amended) A multilayer pipe having an inner layer of a thermoplastic polymer and a contoured, seamless metallic barrier layer deposited thereon, wherein the metallic layer is from 0.01 μm to 10 μm in thickness.

74. (Currently amended) A multilayer pipe having a stabilised inner layer of a thermoplastic polymer and a contoured, seamless metallic barrier layer deposited thereon, wherein the metallic layer is from 0.01 μm to 10 μm in thickness, wherein the inner layer comprises an extruded thermoplastic polymer comprising at least one polar stabilizer, and wherein the thermoplastic polymer is selected from the group consisting of:

(i) a thermoplastic polymer provided with pendant polar functional groups,

(ii) a thermoplastic polymer comprising an ~~effective~~ amount of at least one filler provided with pendant polar functional groups, wherein the amount of at least one filler is sufficient to reduce the delamination of the inner layer from the barrier layer, or sufficient to reduce the leaching of the stabilizer from the polymer layer, or both, and

(iii) a thermoplastic polymer comprises a blend of a non-polar thermoplastic polymer and a thermoplastic polymer provided with pendant polar functional groups.

75. (Previously presented) A multilayer pipe according to claim 73, wherein the contoured metallic barrier layer is disposed between the thermoplastic polymer inner layer and at least one additional outer layer.

76. (Previously presented) A multilayer pipe according to claim 73, wherein the thermoplastic polymer of the inner layer comprises a polyolefin.

77. (Previously presented) A multilayer pipe according to claim 76, wherein the polyolefin is selected from the group consisting of polyethylene, cross-linked polyethylene and polypropylene.

78. (Previously presented) A multilayer pipe according to claim 73, wherein the thermoplastic polymer of the inner layer comprises a polar functional polyolefin.

79. (Previously presented) A multilayer pipe according to claim 78, wherein the thermoplastic polymer of the inner layer comprises a polar functional polyolefin produced by grafting of a moiety selected from polar functional groups and monomers onto a polyolefin backbone.

80. (Previously presented) A multilayer pipe according to claim 79, wherein the polar functional polyolefin polymer is a polar functional polyethylene.

81. (Previously presented) A multilayer pipe according to claim 80, wherein the polar functional polyethylene is ethylene/glycidyl methacrylate graft copolymer.

82. (Previously presented) A multilayer pipe according to claim 73, wherein the thermoplastic polymer of the inner layer comprises a blend of a non-polar semi-crystalline polyolefin polymer and a polar functional polyolefin polymer.

83. (Previously presented) A multilayer pipe according to claim 82, wherein the thermoplastic polymer comprises a blend of a polyethylene polymer and a polar functional polyethylene polymer.

84. (Previously presented) A multilayer pipe according to claim 83, wherein the blend of polyethylene polymers is cross-linked.

85. (Previously presented) A multilayer pipe according to claim 73, wherein the outer metallic barrier layer comprises a metal selected from the group consisting of aluminium, stainless steel and copper.

86. (Previously presented) A multilayer pipe according to claim 85, wherein the metallic layer is formed by a method selected from the group consisting of sputtering, spraying, plasma coating, galvanically-coating and electro-deposition.

87. (Previously presented) A multilayer pipe according to claim 86, wherein the outer barrier layer is directly bonded to the inner thermoplastic polymer layer.

88. (Previously presented) A multilayer pipe according to claim 73, wherein the thickness of the deposited metallic barrier is such that the metallic layer acts as a barrier to limit oxygen and water vapour diffusion into the inner thermoplastic polymer layer and also impedes diffusion of stabilisers and other additives out from the inner thermoplastic polymer layer.

Claim 89 (canceled).

90. (Currently amended) A multilayer pipe according to claim 73 89, wherein the metallic layer is from 0.05 μm to 5 μm in thickness.

91. (Previously presented) A multilayer pipe according to claim 73, wherein the shape of the deposited metallic barrier layer and the outer surface of the inner layer is selected from the group consisting of helically convoluted, circumferentially convoluted, corrugated, ribbed, and patterned such that their surfaces vary in cross-section along the length of the pipe in a regular fashion.

92. (Previously presented) A multilayer pipe according to claim 91, wherein the contoured surfaces of the deposited metallic barrier layer and the outer surface of the inner layer are formed with sinusoidal corrugations.

93. (Previously presented) A multilayer pipe according to claim 73, wherein the inner thermoplastic polymer layer comprises a polymeric matrix provided with functional groups that also increase the wetting of the deposited metallic barrier layer by the polymeric matrix.

94. (Previously presented) A multilayer pipe according to claim 73, wherein the surface of the metallic barrier layer is modified to improve its wetting behaviour.

95. (Previously presented) A multilayer pipe according to claim 74 wherein the polar stabiliser is selected from the group consisting of a phenolic antioxidant, a phosphite, a phosphonite, a benzotriazole and a sterically-hindered amine.

96. (Previously presented) A multilayer pipe according to claim 74 wherein the stabiliser is present in the inner polymeric layer in an amount of from 0.01 to 5 weight percent, based on the weight of the inner polymeric layer.

97. (Previously presented) A multilayer pipe according to claim 74 wherein the filler is inorganic-based filler.

98. (Previously presented) A multilayer pipe according to claim 74 wherein the inorganic-based filler is selected from the group consisting of talc, mica, calcium carbonate, kaolin, clay, magnesium hydroxide, calcium silicate, carbon black, graphite, iron powder, silica, diatomite, titanium oxide, iron oxide, pumice, antimony oxide, dolomite, dawsonite, zeolitic filler, vermiculite, montmorillonite and hydrated alumina.

99. (Previously presented) A multilayer pipe according to claim 74 wherein the inorganic-based filler has a mean particle diameter of up to 10 μm .

100. (Previously presented) A multilayer pipe according to claim 74 wherein the inorganic-based filler(s) content of the inner polymeric layer is from 0.5 to 25 weight

percent, based on the weight of the polymeric matrix.

101. (Previously presented) A multilayer pipe according to claim 74 wherein the filler is selected from the group consisting of filler having pendant functional polar groups on its surface and filler that has been treated to produce such surface functional groups.

102. (Previously presented) A multilayer pipe according to claim 74 wherein the filler comprises a component selected from the group consisting of talc, mica, calcium carbonate, hydrated alumina and titanium dioxide.

103. (Previously presented) A multilayer pipe according to claim 74 wherein the filler is a nanofiller.

104. (Previously presented) A multilayer pipe according to claim 103, wherein the nanofiller is present in an amount of from 1% to 5% by volume, based on the volume of the inner polymeric layer.

105. (Currently amended) A multilayer pipe according to claim 104, wherein the particles of the nanofiller are ~~substantially~~ uniformly dispersed in the inner polymeric layer.

106. (Previously presented) A multilayer pipe according to claim 74 wherein an adhesive layer is disposed between the inner polymeric layer and the contoured deposited metallic barrier layer.

107. (Previously presented) A multilayer pipe according to claim 106, wherein the adhesive layer comprises a polymer comprising one or more functional groups selected from the group consisting of carboxyl, carboxylic, anhydride, epoxy, hydroxyl, isocyanate, aldehyde ester, acid amide, amino, hydrolysable silyl and cyano.

108. (Previously presented) A multilayer pipe according to claim 75, wherein the additional outer polymeric layer comprises cross-linked polyethylene.

109. (Withdrawn) A method of producing a multilayer pipe comprising an inner layer of a thermoplastic polymer and a metallic barrier layer, which comprises extruding a polymeric composition comprising a thermoplastic polymer to form an inner layer having a contoured outer surface and depositing a metallic barrier layer onto the contoured surface.

110. (Withdrawn) A method according to claim 109, wherein the thermoplastic polymer comprises at least one polar stabilizer, and wherein the thermoplastic polymer is selected from the group consisting of:

- (i) a thermoplastic polymer provided with pendant polar functional groups,
- (ii) a thermoplastic polymer comprises an effective amount of at least one filler provided with pendant polar functional groups, and
- (iii) a thermoplastic polymer comprises a blend of a non-polar thermoplastic polymer and a thermoplastic polymer provided with pendant polar functional groups.

111. (Withdrawn) A method according to claim 109, wherein the inner layer is separately extruded in a first step.

112. (Withdrawn) A method according to claim 109, wherein the inner layer is extruded using an apparatus selected from the group consisting of (i) a corrugator and (ii) an extruder provided with a rotating die to provide a pipe having a smooth inner wall and a helically corrugated outer wall.

113. (Withdrawn) A method according to claim 109, wherein an internal mandrel is used to provide increased pressure on the corrugated outer wall and thereby obtain a

smooth contoured outer surface on the inner layer for deposition of the metallic barrier layer.

114. (Withdrawn) A method according to claim 109, wherein the metallic barrier layer is deposited on the outer contoured surface of the inner layer to a thickness suitable to obtain the desired barrier properties against moisture, oxygen and organic contaminants.

115. (Withdrawn) A method according to claim 109, wherein the metallic barrier layer is deposited by a sputtering technique.

116. (Withdrawn) A method according to claim 109, wherein the metallic barrier layer is deposited by a method selected from the group consisting of arc spraying, flame spraying, plasma spraying and HVOF.

117. (Withdrawn) A method according to claim 109, wherein the surface of the metallic barrier layer is modified to improve its wetting behaviour.

118. (Withdrawn) A method according to claim 117, wherein the metallic barrier layer is treated by physical surface modification.

119. (Withdrawn) A method according to claim 118, wherein the metallic barrier layer is treated by a method selected from the group consisting of plasma treatment, abrasion, ablation, and cleaning.

120. (Withdrawn) A method according to claim 117, wherein the metallic barrier layer is treated by chemical surface modification.

121. (Withdrawn) A method according to claim 120, wherein the metallic barrier layer is treated by a method selected from the group consisting of solvent cleaning, chemical cleaning, treatment with chemical modifying agents to introduce surface functional

groups, deposition of surface layers by plasma deposition of a polymeric layer containing functional groups, deposition of a glassy layer, and other surface coating techniques.

122. (Withdrawn) A method according to claim 109, wherein an additional outer polymeric layer is extrusion coated onto the contoured metallic barrier layer.

123. (Withdrawn) A method according to claim 122, wherein the extruded additional outer layer provides a smooth outer surface for the pipe.

124. (Previously presented) A multilayer pipe according to claim 73 further comprising an outer layer, wherein the compressive E-modulus of the inner layer is lower than the compressive E-modulus of the outer layer.

Claim 125 (canceled).

126. (Currently amended) A multilayer plastics pipe comprising a plastics inner layer, a seamless metallic barrier layer of from 0.01 μ m to 10 μ m in thickness and a plastics outer layer, wherein the pipe is capable of axial deformation and the compressive E-modulus of the inner layer is lower than the compressive E-modulus of the outer layer.

127. (New) A multilayer pipe according to claim 74 further comprising an outer layer, wherein the compressive E-modulus of the inner layer is lower than the compressive E-modulus of the outer layer.